

## **Microstructure and Macrosegregation Study of Directionally Solidified Al-7Si Samples Processed Terrestrially and Aboard the International Space Station**

Samuel Angart, Graduate Student, R.G. Erdman, Associate Professor, and David R. Poirier, Professor, The University of Arizona; S.N. Tewari, Professor, Cleveland State University; and R. N. Grugel, Metallurgical Engineer, NASA-Marshall Space Flight Center.

This talk reports research that has been carried out under the aegis of NASA as part of a collaboration between ESA and NASA for solidification experiments on the International Space Station (ISS). The focus has been on the effect of convection on the microstructural evolution and macrosegregation in hypoeutectic Al-Si alloys during directional solidification (DS). The DS-experiments have been carried out under 1-g at Cleveland State University (CSU) and under low-g on the International Space Station (ISS). The thermal processing-history of the experiments is well defined for both the terrestrially-processed samples and the ISS-processed samples. We have observed that the primary dendrite arm spacings of two samples grown in the low-g environment of the ISS show good agreement with a dendrite-growth model based on diffusion controlled growth. The gravity-driven convection (i.e., thermosolutal convection) in terrestrially grown samples has the effect of decreasing the primary dendrite arm spacings and causes macrosegregation. In order to process DS-samples aboard the ISS, dendritic-seed crystals have to partially remelted in a stationary thermal gradient before the DS is carried out. Microstructural changes and macrosegregation effects during this period are described.